



MAINE HISTORIC PRESERVATION COMMISSION  
55 CAPITOL STREET  
65 STATE HOUSE STATION  
AUGUSTA, MAINE  
04333

JOHN ELIAS BALDACCI  
GOVERNOR

EARLE G. SHETTLEWORTH, JR.  
DIRECTOR

September 29, 2004

Mr. Gil Paquette  
Devine, Tarbell and Associates, Inc.  
970 Baxter Blvd.  
Portland, ME 04103

RE: Banghor Hydro-electric proposed Northeast Reliability Interconnect project

Dear Mr. Paquette:

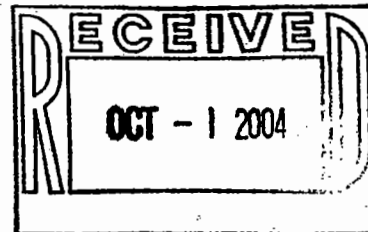
I have reviewed the scope-of-work that has been prepared by TRC for archaeological Phase I survey for the Northeast Reliability Interconnect project from Orrington to the St. Croix River. The scope is acceptable in all respects. I look forward to reviewing the report of the survey results.

Sincerely,

Dr. Arthur Spiess  
Archaeologist

[arthur.spiess@state.me.us](mailto:arthur.spiess@state.me.us)

cc: Dr. Richard Will, TRC





**Devine Tarbell & Associates, Inc.**  
Consulting Engineers, Scientists, & Regulatory Specialists

September 28, 2004

Principals:  
John J. Devine, P.E., President  
John C. Tarbell, P.E.  
James M. Lynch  
Edwin C. Luttrell, P.E.

005.0003.0100/2.0

Dr. Arthur Speiss, Prehistoric Archaeologist  
Maine Historic Preservation Commission  
State House Station 65  
Augusta ME 04333

**Subject: Bangor Hydro-Electric (BHE)  
Proposed Northeast Reliability Interconnect Project  
Archaeological Review**

Dear Dr. Speiss:

Bangor Hydro-Electric Company (BHE) is pleased to submit this Archeological Review summary of the Proposed Northeast Reliability Interconnect Project. Enclosed, is a memo from Jim Clark of TRC describing his effort to investigate potential archaeological resources along the proposed project, methods proposed to complete the Phase I survey, and a table summarizing archaeological testing recommend for the project, including supporting figures.

With this letter, we are requesting your written concurrence of the areas and methodology proposed with the recommendations made in the attached memo. Should you have any questions or need additional information, please contact me at 775-4495 or Jim Clark at 667-4055.

Sincerely,

DEVINE TARBELL & ASSOCIATES, INC.

  
Gil A. Paquette, CWB, PWS  
Project Manager

GAP/  
Enclosures

cc: R. McAdam, Emera  
J. Browne, V&D  
R. Will, TRC (w/o enclosure)  
File

R. Bennett, BHE  
J. Clark, TRC (w/o enclosure)

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970 Baxter Boulevard • Portland, Maine 04103

Portland, Maine  
207-775-4495/1031 (fax)

Charlotte, North Carolina  
704-377-4182/4185 (fax)

Sacramento, California  
916-564-4214/4203 (fax)

Bothell, Washington  
425-485-5668/5934 (fax)

Syracuse, New York  
315-641-1624/1626 (fax)

[www.devinetarbell.com](http://www.devinetarbell.com)

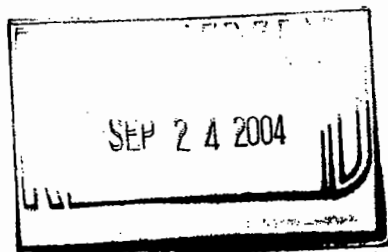
Bellingham, Washington  
360-671-1150/1152 (fax)

# TRC

Customer-Focused Solutions

September 22, 2004

Mr. Gil Paquette  
Devine and Tarbell & Associates  
970 Baxter Boulevard  
Portland, Maine 04103



Dear Gil,

I spoke with Dr. Arthur Spiess at MHPC in Augusta this morning. He indicated to me that he would like written documentation of the areas and methods that we are proposing for the BHE 345 kV Phase I survey. Please consider this letter TRC's proposal to complete the survey as we have discussed. You will note that it essentially reiterates information that we have discussed in previous correspondence. Dr. Spiess will need to review and approve this proposal before we can begin. Feel free to forward this to him if you find it acceptable.

## Project Description

Bangor Hydro Electric (BHE) and project consultant Devine & Tarbell Associates (DTA) are currently developing plans for a 345 kV electric transmission tie line that will extend from a substation in Orrington, Maine to the Canadian border at the St. Croix River north of Baileyville, Maine. This route is one of five alternates that were evaluated for archaeological sensitivity in a previous report (see letter report from James Clark to Gil Paquette, December 30, 2003). TRC Customer Focused Solutions has been asked by DTA to conduct a Phase I survey for cultural resources along the alternate that has been selected for development, known and "the Consolidated Route."

From September 13-17, 2004, Edward Moore and James Clark conducted a reconnaissance of the currently proposed BHE 345 kV route to determine the specific locations and scope of testing needed at numerous areas that were previously identified as archaeologically sensitive. A portion of this route will occupy a corridor previously surveyed by the Stephen Cox in 1989 during a previous development of the 345 kV project. These portions of the route having already received permits were not inspected and will not be included in this Phase I survey. Most of the route will be located immediately north of the Stud Mill Road, and will parallel the M&N Natural Gas Pipeline project that received survey for archaeological resources in 1998 and 1999.

The standard corridor inspected was 250' wide with an outer boundary just off the Stud Mill Road. However, a number of areas have been designated as expanded workspace areas that are to be "surveyed wide" to accommodate future line placement decisions. In these locations, soils and landforms were examined to a width of from 300' to 600' off the Stud Mill Road. The proposed route generally stays north of the existing M&N natural gas pipeline, and in a few locations where the pipeline crosses the road, the proposed transmission line swings well wide of the Stud Mill Road.

## Results of Reconnaissance Inspection

Determining locations where archaeological sampling is called for based only on map inspection of linear projects that traverse great distances often tends to over-estimate the amount of testing necessary to adequately sample for cultural resources. Reconnaissance survey is a way to save field time and cost by closely delimiting both the location and the scope of archaeological testing required before a full crew is put into the field. On the proposed BHE line, 17 areas had

previously been determined to possess high archaeological sensitivity and 34 areas were thought to have "moderate" sensitivity. Field reconnaissance inspection of the BHE line has enabled us to refine that scope of work significantly.

Areas that are here identified for Phase I archaeological testing generally fall into one or more categories. They are locations in close proximity to previously identified archaeological sites, or they are areas that exhibit archaeologically sensitive soils and landforms, or they are adjacent to major streams and wetland drainages. Except in these locations, the majority of the proposed transmission line corridor does not possess great archaeological sensitivity. Numerous areas that had been previously identified as "moderately sensitive" based on 7-1/2 minute topographic map inspection were, upon field inspection, dismissed from consideration. Most of these areas either border minor or intermittent streams and wetlands, are disturbed by logging activities, display no marked break in slope or inhabitable surface, or have received testing with a negative result during previous archaeological surveys conducted for BHE and the M&N Pipeline.

### **Proposed Scope of Work**

This document and the maps that accompany it represent a determination of proposed archaeological testing areas along the current route alignment based on field inspection. Exclusive of uninspected areas, our reconnaissance resulted in the finding that there are 15 areas along the proposed route at which subsurface archaeological testing (shovel test pits) is recommended. We estimate that these areas can adequately be tested using approximately 200-205 shovel test pits. Table 1 and the accompanying figures present location information on the areas proposed for archaeological testing.

This is not the total amount of testing that will likely eventually be required. Three large segments of the presently proposed route will depart from Cox's 1989 survey route and the Stud Mill Road (the section east of Route 1 in Princeton, a 6 mile section east of the Machias River, and a section northeast of Titcomb Brook in the area of "The Horseback"). These were not examined for archaeological sensitivity. These segments will be need to examined and a scope of testing at specific locations will be recommended as soon as we have been given access to them. Hopefully, this field inspection can occur concurrently with subsurface testing at the areas identified in this proposal.

Additionally, we did find one location (Myra) where it looks as though the proposed transmission line route may cross an area that was settled historically. We recommend the involvement of an historic archaeologist regarding the necessity for, and amount and location of testing for historic resources. We further propose to have the historical archaeologist take evaluate the proposed route maps and identify any other areas that might require historic attention. The portion of the route east of Route 1 in Baileyville may possess a greater chance of historic settlement than other portions of the route that largely crosses undeveloped timberlands.

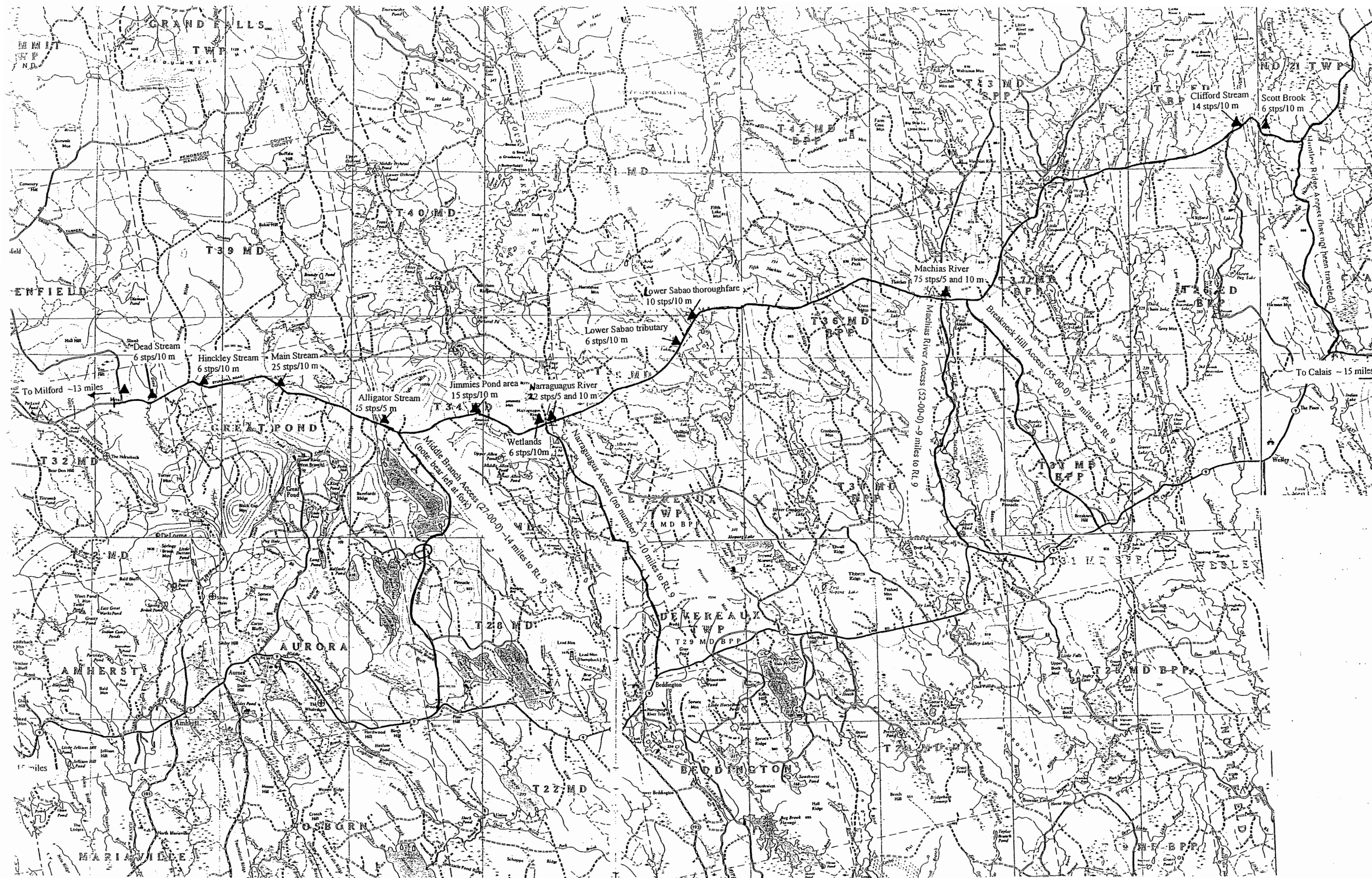
### **Methods**

Phase I cultural resource survey will entail survey for the presence of prehistoric cultural resources within the defined transmission line impact area. Phase I survey methods will conform to standards established by the Maine Historic Preservation Office and will include, but not be limited to, a literature search for archaeological sites in and around the project area, field testing for cultural materials, laboratory analysis of materials recovered, and preparation of a final report with results and recommendations.

Table 1. Summary of archaeological testing recommended for the BHE 345 kV transmission line project. Coordinates given are UTM NAD 83.

Location	Description	Easting	Northing	Recommended testing	STPS To be determined
Myra	Historic settlement?	547542	4980732	Survey by historic archaeologist- testing likely	
Dead Stream	Stream Crossing	548933	4980739	6 stps on west side of stream	6
Hinckley Stream	Stream Crossing	551350	4981569	6 stps on both east and west side of stream	12
Main Stream	Stream Crossing	555396	4981503	10 stps on east; 15 stps on west along stream bank	25
Alligator Stream	Stream Crossing	560441	4979750	6 stps on east side; high sandy outwash; 5 m interval; walkover of extensively exposed soils	6
Jimmies Pond	Wetland Area	565366	4980315	test intermittment glacial landforms adjacent to wetlands	20
Narraguagus Wetlands	Wetland Area	568629	4979714	Test prominent elevated landform on east side of wetland; 6stps on 10 m	6
Narraguagus River	River Crossing	568826	4979796	Test high ground 100 m east of bridge; walkover exposed soils	6
Narraguagus River	River Crossing	569039	4979879	Test break in slope over looking river/wetland margin; 10 m on 10; test along river edge 5-15 m back from	16
Unnamed Stream	Stream Crossing	575613	4983614	Test east side of tributary from Campbell Lake to Sabao Lake; 6 stps on west side	6
Sabao Clearing	Blowout?	576206	4984655	Walkover inspection of exposed sandy soilssandy	0
Burnt Land/Sabao Thorofare	Outlet stream	576434	4985022	Test both sides of thorofare within corridor; 6 stps on east; 4 stps on west	10
Machais River	River Crossing	589115	4986197	Extensive testing on both sides of River (see notes)	60
East of Machias River	Outwash feature	589481	4986236	6 stps south and 4 stps north of last remaining undisturbed area	10
Clifford Brook	Stream Crossing	603558	4994781	6 stps on south side 125 m back on highest terrace; 8 tps on north side along stream edge and on upper terrace	14
Scott Brook	Stream Crossing	604989	4994805	6 stps on elevated terrace 75 m east of brook; historic camp	6
					203





GRAND FALLS  
TWP  
COUNTY  
PENOBSCOT  
HANGOCK  
ENFIELD  
T39 MD  
T32 MD  
T28 MD  
T22 MD  
AMHERST  
AURORA  
OSBURN  
MAINTAINVILLE

Dead Stream  
6 stps/10 m  
Hinckley Stream  
6 stps/10 m  
Main Stream  
25 stps/10 m  
Alligator Stream  
15 stps/5 m  
Jimmys Pond area  
15 stps/10 m  
Wetlands  
6 stps/10 m  
Narraguagus River  
22 stps/5 and 10 m  
Lower Sabao tributary  
6 stps/10 m  
Lower Sabao thoroughfare  
10 stps/10 m  
Middle Branch Access (27-00-0) - 14 miles to Rt. 9  
Narraguagus Access (no number) - 10 miles to Rt. 9

Machias River  
75 stps/5 and 10 m  
Machias River Access (52-00-0) - 9 miles to Rt. 9  
Breakneck Hill Access (55-00-0) - 9 miles to Rt. 9  
T36 MD  
T34 MD  
T32 MD  
T28 MD  
T22 MD  
T29 MD  
T23 MD  
T21 MD  
BEDDINGTON  
DEVEREAUX  
TWP

Clifford Stream  
14 stps/10 m  
Scott Brook  
6 stps/10 m  
To Calais - 15 miles  
The Pines  
Wetley  
T31 MD  
T29 MD  
T28 MD  
T27 MD  
T26 MD  
T25 MD  
T24 MD  
T23 MD  
T22 MD  
T21 MD



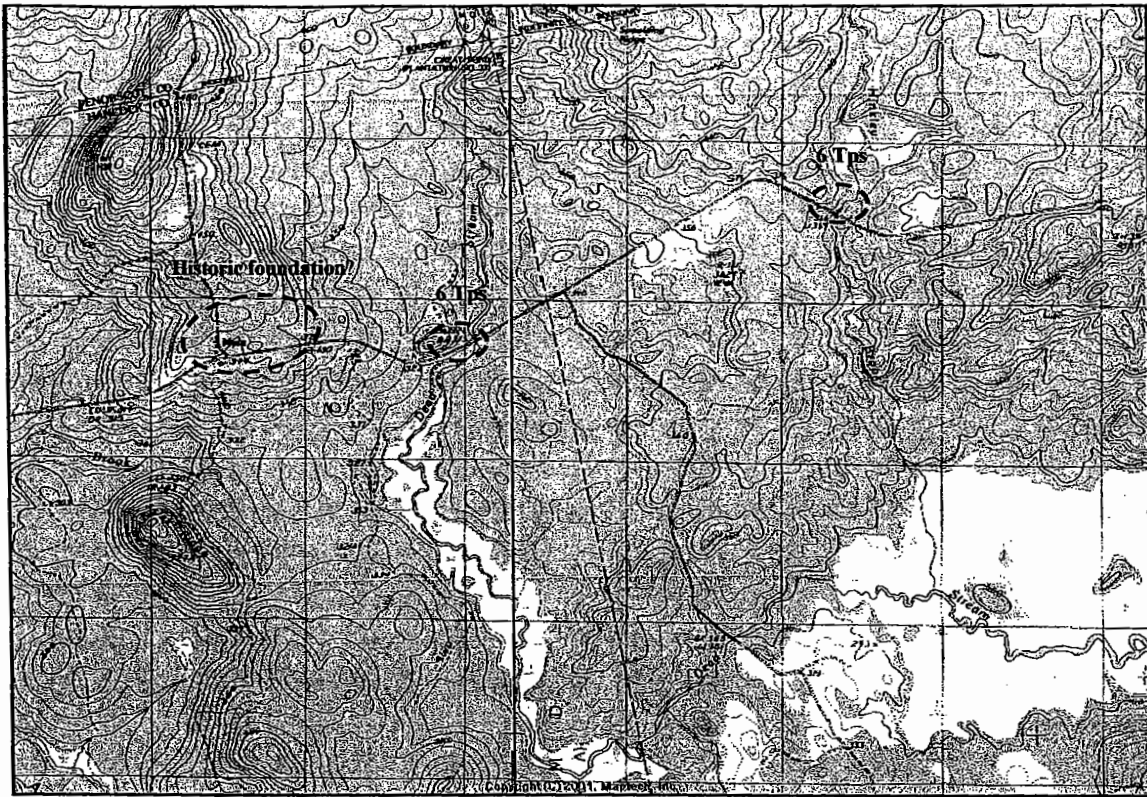


Figure 2. Section of USGS 7.5 minute topographic map, Great Pond, Maine quadrangle showing location of proposed archaeological testing areas.

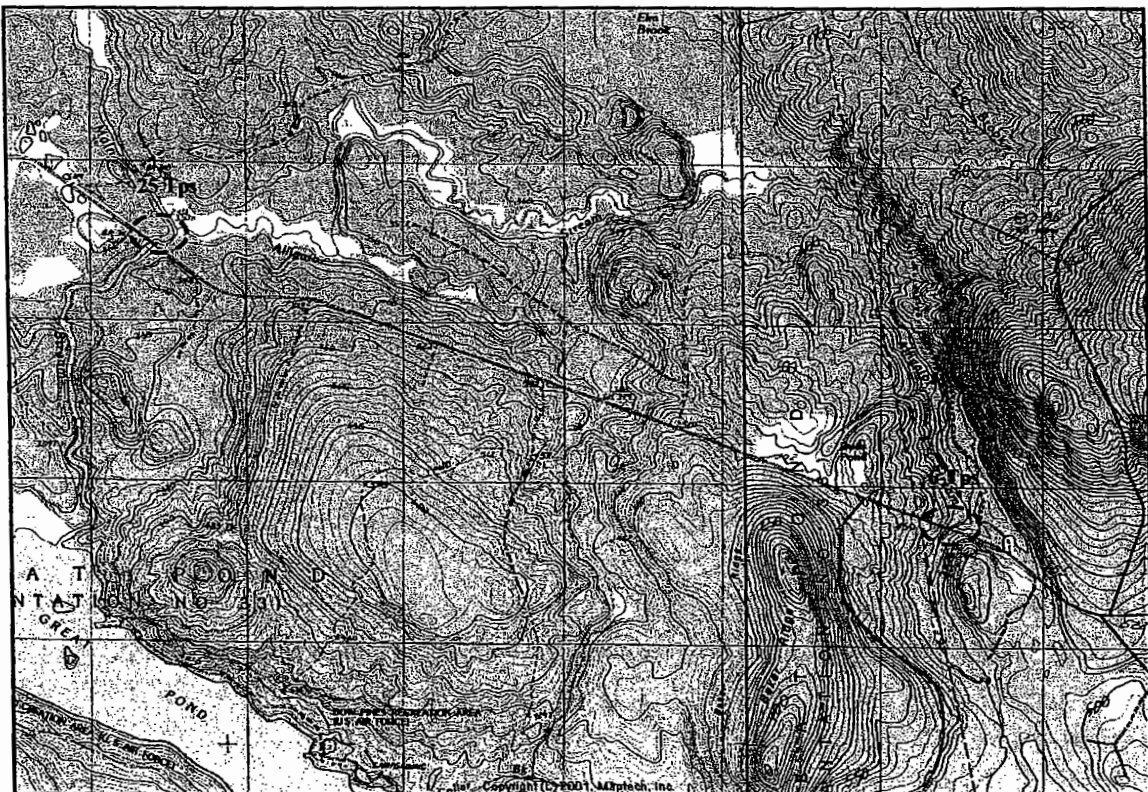


Figure 3. Section of USGS 7.5 minute topographic map, Great Pond-Quillipeg, Maine quadrangle showing location of proposed archaeological testing areas.

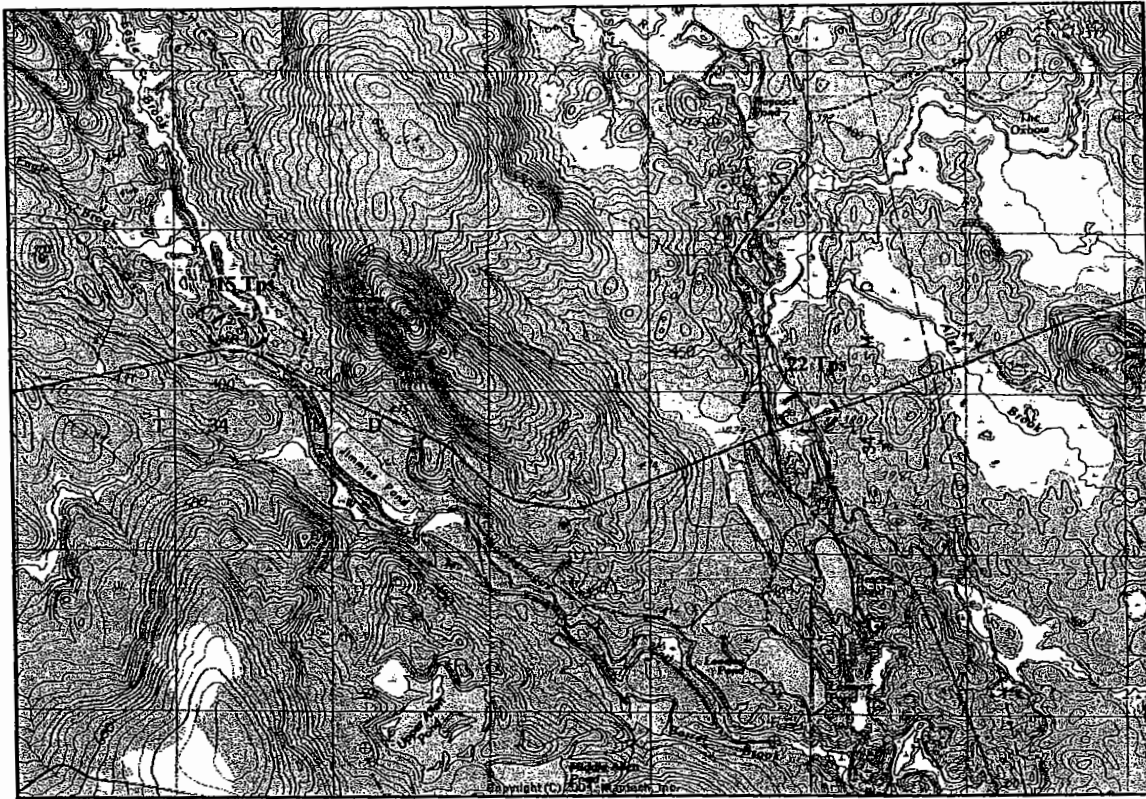


Figure 4. Section of USGS 7.5 minute topographic map, Alligator Lake, Maine quadrangle showing location of proposed archaeological testing areas.

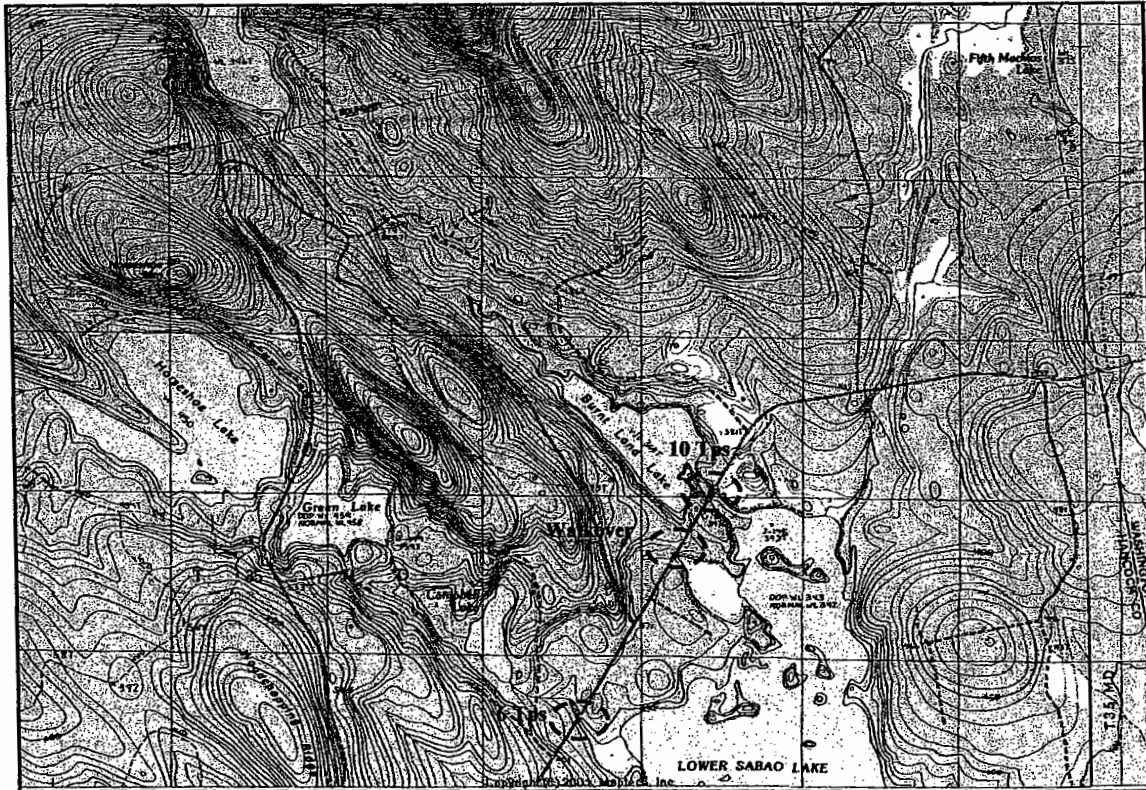
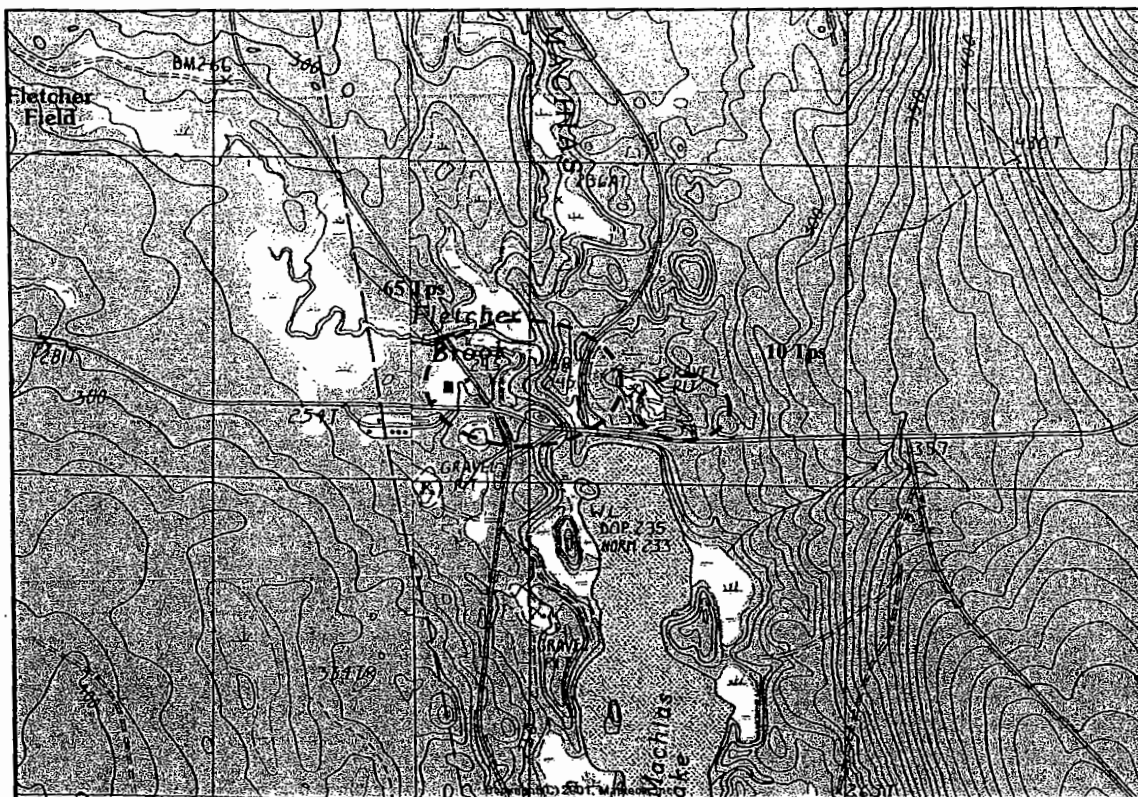
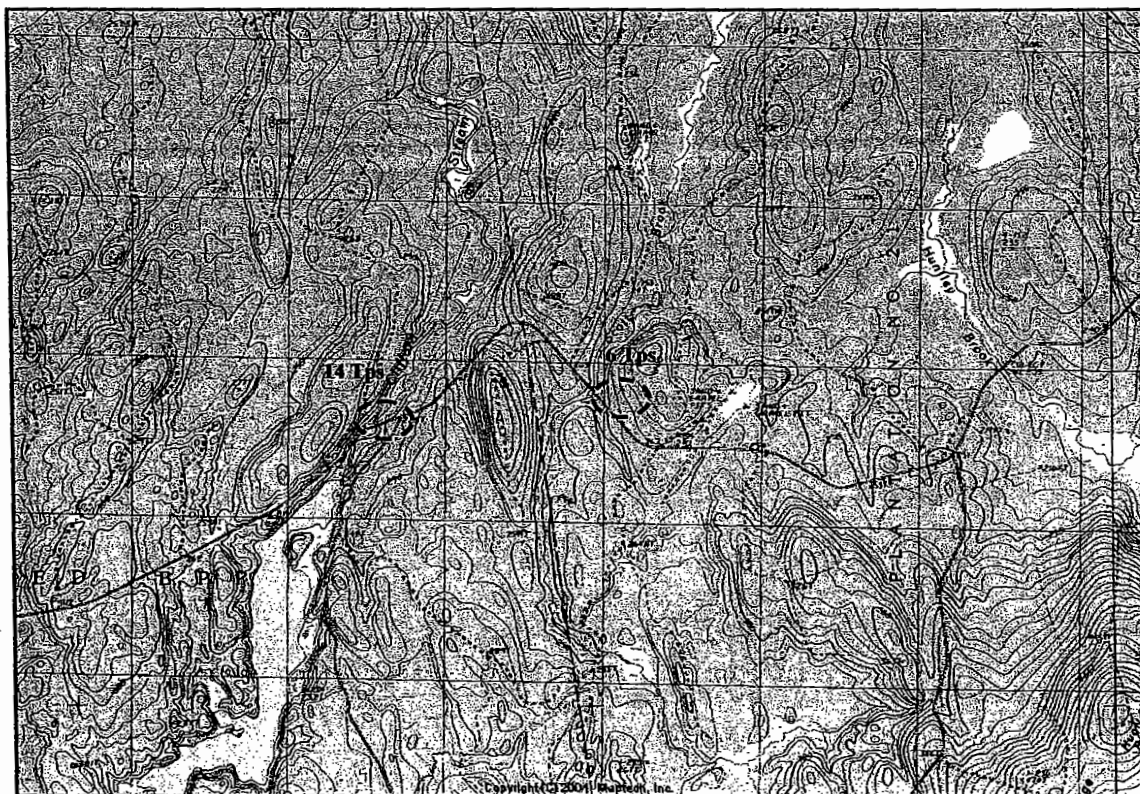


Figure 5. Section of USGS 7.5 minute topographic map, Gassabias Lake, Maine quadrangle showing location of proposed archaeological testing areas.





**Figure 6. Section of USGS 7.5 minute topographic map, Monroe Lake, Maine quadrangle showing location of proposed archaeological testing areas.**



**Figure 7. Section of USGS 7.5 minute topographic map, Clifford Lake, Maine quadrangle showing location of proposed archaeological testing areas.**



December 20, 2004

005.0003.0100/2.0

Mr. Earle G. Shettleworth, Jr., Director  
Maine Historic Preservation Commission  
55 Capitol Street  
65 State House Station  
Augusta, Maine 04333-0065

**VIA FEDEX PRIORITY**  
**207-287-2132**

**Subject: Information Request for Bangor Hydro-Electric Company's Proposed  
Northeast Reliability Interconnect Project**

Dear Mr. Shettleworth:

TRC Environmental Corporation (TRC) and Devine Tarbell & Associates, Inc. (DTA) are currently assisting Bangor Hydro-Electric Company (BHE) in preparing state permit applications for BHE's proposed Northeast Reliability Interconnect project (NRI). The NRI is a proposed 345,000 volt (345 kilovolt [kV]) electric transmission line that will run from an existing substation in Orrington, Maine (Orrington Substation) to the U.S./Canadian border at Baileyville, Maine. The proposed transmission line and modifications to the Orrington Substation will provide a second interconnect between the two existing bulk electric transmission systems in New England and New Brunswick.

The NRI will require modifications to the existing Orrington Substation and construction of approximately 85 miles of new transmission line in Maine. Specifically, this new transmission line would originate from the existing Orrington Substation and would parallel and be immediately adjacent to the existing Maine Electric Power Company (MEPCO) transmission line and/or the Maritimes & Northeast Pipeline, L.L.C. natural gas pipeline (M&N pipeline) from the Orrington Substation, north to a point near Blackman Stream in Bradley for approximately 12 miles (new right-of-way [ROW] width ranges from 100' to 125'). At this point, the route would turn easterly/northeasterly passing through land owned and managed for commercial forest products for a distance of approximately 13.6 miles to a point where the route would join the Stud Mill Road (a privately owned timber haul road) east of Sunkhaze Stream in Myra (T32 MD) (new ROW width of 170'). From this point, the route runs northeasterly and is generally co-located with the Stud Mill Road and/or the M&N pipeline (new ROW width of 135' to 155') for the remaining approximately 59 miles where the route would cross the international border in Baileyville, Maine and would connect with a yet to be constructed, but permitted New Brunswick Power Corporation (NB Power) line to Point Lepreau, New Brunswick. The entire proposed route is shown on the attached USGS quadrangle excerpts.

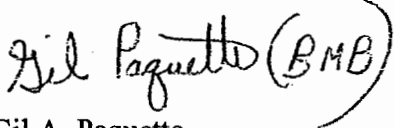
As you are aware, TRC and DTA have been coordinating with you regarding development of the archeological field survey study plan for the NRI. At this time, the entire route has been surveyed and the results of those surveys are attached hereto in a summary memorandum provided by James Clark, TRC Senior Archeologist. In addition, the final report summarizing the archeological field investigations is forthcoming and will be provided to you by the end of December 2004 or in January 2005.

On behalf of BHE, TRC and DTA are requesting information concerning additional historic and archeological resources known to exist within the proposed project area that may have been missed during earlier consultation. Your information will be incorporated into state and federal permit applications associated with the project and will also help form the basis for any mitigative measures that may be necessary during or after construction.

We would appreciate receiving your comments within 30 days. Should you have any questions or need additional information, please do not hesitate to contact me at (207) 879-1930.

Sincerely,

TRC ENVIRONMENTAL CORPORATION



Gil A. Paquette  
Project Manager

GAP/bmb

Enclosures

cc: R. McAdam, Emera (w/o attachment)  
S. Sloan, BHE (w/o attachment)  
J. Browne, Verrill Dana, LLP (w/o attachment)  
L. Ballesteros, BHE (w/o attachment)  
S. Beyer, MDEP (w/o attachment)  
J. Clement, USACE (w/o attachment)  
J. Pell, DOE (w/o attachment)  
B. Vinokour, Argonne National Laboratory (w/o attachment)  
File

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## **Penobscot THPO Meeting**

**11/25/2003**

Attendance: Fred Leigh (BHE), Danielle Faloon Saucier (DTA) and Bonnie Newsom (Penobscot THPO)

- THPO is in the early process of inventorying resources
- Burial sites in Sunkaze, Passadumkeag
- Stud Mill is preferred from the Penobscot view because it isn't rich in cultural resources. MEPCO and Penobscot River area will likely pose several cultural resource issues for the Penobscots.
- BHE should present to Cultural and Historical Preservation Committee if the proposed will follow the MEPCO route.
  - Then tribal comment period- present to tribal council for comment
- Thoreau camp sites (promoting for tourism).
  - Thoreau camped on several islands in the Penobscot
  - Bonnie was going to work to identify the names of these islands
  - Bonnie provided her email address as: [Bnewsom@penobscotnation.org](mailto:Bnewsom@penobscotnation.org)
- Bonnie recommended contacting four tribes
  - Penobscots- Bonnie Newsom
  - Aroostook Band of Micmacs- Bernard Jerome (cultural person)
  - Passamaquaddy- Don Soctomah
  - Houlton Band of Maliseets- Sharri Venno
- Bonnie was going to discuss the project with John Banks of the Penobscot Natural Resources Dept and with Chief Barry Dana
- Penobscots will be interested in any tribal cultural/historic resource impacts even if those sites are not on tribal lands.
- Bonnie was also going to have Chief Dana submit a letter to BHE regarding issues the Tribe may see with MEPCO alternative
- We also offered to send Bonnie close-up map views of where the MEPCO and MEPCO South routes cross the Penobscot River and Bonnie thought it would be very helpful.

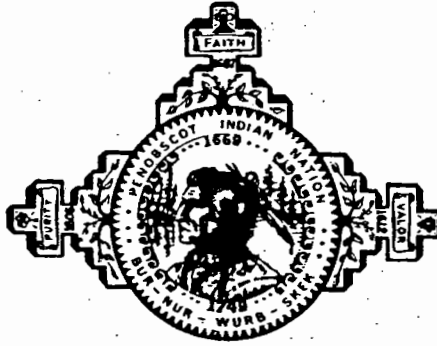


Office of the Chief and Council

Barry L. Dana  
Chief

Michael M. Bear  
Vice-Chief

Donna M. Loring  
Representative



Community Building  
Indian Island, Maine 04468  
(207) 827-7776

FAX (207) 827-6042

Bangor Hydro Electric Co.  
ATTN: Fred Leigh Jr.  
PO Box 932  
Bangor, ME 04402-0932

RE: Northeast Reliability Interconnect Project

12/4/2003

Dear Mr. Leigh,

Thank you for consulting with the Penobscot Nation on the above-referenced project. We hold firmly in our belief that the Penobscot River is of deep cultural, spiritual and historic significance to the Penobscot people. We fear that the MEPCO Alternative to Point Lepreau, may impact some of our ancestral sites and our efforts to sustain our traditional uses of the river. To protect the cultural, spiritual, and historic integrity of the Penobscot River, we are requesting Bangor Hydro Electric avoid the MEPCO Alternative to Point Lepreau and use the Consolidated Corridors Route Alternative along the Stud Mill road for the Northeast Reliability Interconnect Project. In our opinion, this route would have the least impact on our cultural, spiritual and historic resources. We appreciate your consultation and look forward to continued communication on this project. Should you need additional information, please contact Bonnie Newsom, THPO at 827-4168.

Sincerely,

Barry Dana  
Chief



March 4, 2004

Bonnie Newsome  
Tribal Historic Preservation Officer  
Penobscot Nation  
6 River Road  
Old Town, ME 04468

Dear Bonnie,

I am writing to thank you for taking the time to provide input to Bangor Hydro regarding our route analysis process for the Northeast Reliability Interconnect (NRI). The input you provided has been very helpful. Bangor Hydro is committed to considering stakeholder input as part of our decision analysis.

While there are public concerns on each of the route alternatives it is necessary for Bangor Hydro to evaluate those concerns equally in our analysis. The process of choosing a transmission line route is not an easy one. For purposes of analysis we have developed a set of 70 criteria to observe an array of possible impacts on each route. These categories are project purpose, project cost, landuse, wetlands/waterbodies, flora, fauna, fisheries, recreational/visual and cultural resources. The process of route selection involves understanding and balancing the impacts that may occur along each of the route alternatives.

Your input, and input of others, regarding each of the alternatives has been very helpful in consideration of our route analysis effort. The project team has noted your input and will use it as part of the decision making process. Your participation will become part of the project record surrounding the route selection decision. While a route has yet to be selected, Bangor Hydro is committed to minimizing environmental impacts related to constructing the NRI project along any proposed route.

Thank you again for your involvement in this process and feel free to contact myself with further questions or concerns.

Sincerely,

Fred Leigh  
NRI Project Manager  
Phone: (207) 973-2543  
Fax: (207) 973-2545  
Email: Fleigh@bhe.com

COPY



March 4, 2004

Donald Soctomah  
Tribal Historic Preservation Officer  
Passamaquoddy Tribe  
PO Box 102  
Princeton, Maine 04668

Dear Donald,

I am writing to thank you for taking the time to provide input to Bangor Hydro regarding our route analysis process for the Northeast Reliability Interconnect (NRI). The input you provided has been very helpful. Bangor Hydro is committed to considering stakeholder input as part of our decision analysis.

While there are public concerns on each of the route alternatives it is necessary for Bangor Hydro to evaluate those concerns equally in our analysis. The process of choosing a transmission line route is not an easy one. For purposes of analysis we have developed a set of 70 criteria to observe an array of possible impacts on each route. These categories are project purpose, project cost, landuse, wetlands/waterbodies, flora, fauna, fisheries, recreational/visual and cultural resources. The process of route selection involves understanding and balancing the impacts that may occur along each of the route alternatives.

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Thank you again for your involvement in this process and feel free to contact myself with further questions or concerns.

Sincerely,

Fred Leigh  
NRI Project Manager  
Phone: (207) 973-2543  
Fax: (207) 973-2545  
Email: Fleigh@bhe.com

COPY



March 4, 2004

Sharri Venno  
Environmental Planner  
Houlton Band of Maliseet Indians  
88 Bell Road  
Littleton, ME 04730

Dear Sharri,

I am writing to thank you for taking the time to provide input to Bangor Hydro regarding our route analysis process for the Northeast Reliability Interconnect (NRI). The input you provided has been very helpful. Bangor Hydro is committed to considering stakeholder input as part of our decision analysis.

While there are public concerns on each of the route alternatives it is necessary for Bangor Hydro to evaluate those concerns equally in our analysis. The process of choosing a transmission line route is not an easy one. For purposes of analysis we have developed a set of 70 criteria to observe an array of possible impacts on each route. These categories are project purpose, project cost, landuse, wetlands/waterbodies, flora, fauna, fisheries, recreational/visual and cultural resources. The process of route selection involves understanding and balancing the impacts that may occur along each of the route alternatives.

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Thank you again for your involvement in this process and feel free to contact myself with further questions or concerns.

Sincerely,

A handwritten signature in black ink, appearing to read "Fred Leigh".

Fred Leigh  
NRI Project Manager  
Phone: (207) 973-2543  
Fax: (207) 973-2545  
Email: Fleigh@bhe.com

COPY



Route Selection Process Meeting 01/07/2004, 9:00 am

Attendance:

Sherry Veno (Houlton Band of Maliseets)  
Bonnie Newsom (Penobscot Nation)  
Donald Soctomah (Passamaquoddy)  
Fred Leigh (Bangor Hydro)  
Shirar Wilder (Bangor Hydro)

Fred started the meeting by making sure that all in attendance had a copy of the Alternatives Analysis map so they could identify which route was where. Donald noted that the routes have changed significantly since the last attempts. Fred responded by saying that we went back to square one and revamped the Alternatives Analysis process for the current permitting process.

Fred explained the stakeholder meeting process that has taken place this fall. He noted that the process has resulted in over 60 engineering and environmental criteria. He generally discussed the routes and where they stand at the current time:

*Not in consideration*

MEPCO: The route does not work for the project because it involves a number of engineering complexities and does not meet the project purpose.

Route 9: A number of cold water fisheries, salmon streams etc present a number of problems

Previously Permitted Route: Previously denied. Can most likely use some areas of the route but there are too many issues to go with this route.

*In consideration*

Consolidated Corridors Route: In consideration, Issues with AC Mitigation/Pipeline that are being worked out. The salmon agencies raise environmental concerns due to the in stream work that will need to be done for AC mitigation. Potential difficulties due to Endangered Species Act. The salmon agencies also note that the pipeline is almost at full restoration and this would be disturbed if it were trenched for AC Mitigation. NRCM is concerned about breaking up large tracts of land.

MEPCO South: Longer, potentially higher costs, large number of landowners along route & concerns of Penobscots. No in stream work.

Will need to balance the difficulties of each route to make a decision. BHE is in the process of researching the two routes still in consideration. Waiting for the costs of AC mitigation, landowner info etc. The reason for the meeting is so BHE can gain input on the remaining routes from the tribes.

Fred mentioned the letter from the Penobscots indicating their desire for BHE to locate the line on the Stud Mill road rather than the MEPCO route. This is due to the fact that there are more culturally significant lands on MEPCO.

Fred discussed Rick Will's Phase I Archeological review. He noted the High-Moderate results for each of the five routes:

MEPCO: 54, MEPCO So: 57, CCR: 51, Rte 9: 50, PPR: 51

Fred noted that this is not site specific data as a Phase II would provide. This notes the possibility of archeologically significant sites that warrant further investigation. Donald requested a copy of the Phase I report and Fred said that it would be provided to them when a final copy is received. Within the next week or so most likely.

Fred discussed BHE's desire to determine how to work with the Tribes if MEPCO South is selected as the preferred route.

Bonnie had a question re where MEPCO So crosses the Penobscot River. Fred noted that it will cross at the Mattaseunk Dam (Lincoln) and a new crossing would be created near Chester to head east. Bonnie

questioned if there would be additional work along the river. Fred noted that H-Frame wooded structures exist. Another set of H-Frame poles would be added w/ 3 conductors. The new structures would look just like the existing structures. The line would follow the existing corridor east of the river for several miles; the new crossing would bring it west of the river.

Bonnie noted that she would like to avoid crossing the Penobscot River if possible, but understands BHE's need and why we are closely looking at the MEPCO So route. After reading the Phase I Archeological Review she has a better understanding of what sites exist. She would have to talk to Chief Dana and John Banks but does not see major problems with MEPCO So as long as we continue to work with them in micro siting of the line. She noted that she is also supportive of the salmon issues related to routes further south and imagines that Chief Dana and John Banks would also be supportive of the Salmon Agencies.

Fred suggested a field trip to look at the existing line, where the new line would cross the Penobscot River and how the line would look. Bonnie was very receptive to the idea and would like to do that.

Donald asked about the St. Croix River and the border crossing. He wanted to know if the Canadians would be responsible for the line on the U.S. side.

Fred noted that it would be a new transmission line crossing. Most likely BHE would be responsible for construction on the U.S. side and New Brunswick Power would be responsible for construction on the other side. However Fred was not positive about the details and made note that was his presumption. Donald noted that with the pipeline the Canadians put it in on the U.S. side. Donald wants a sense of how this will work because he is currently dealing with both governments on a project north of Bearing.

Donald also wanted to know if the Transmission Line would be close to the pipeline. Fred responded that it looks like it would be about a mile north or south of the pipeline. Donald questioned if Rick Will has studied the area. Fred said preliminary studies in the Phase I Archeological review but this is one of the areas that will warrant further study.

Donald raised the question of the number of streams/river crossings for the routes to compare them. Fred gave him the following numbers from the matrix:

Class AA Rivers/Streams: PPR 17, CCR 10, M 3, MS 5, Rte9 6

Class A Rivers/Streams: PPR 44, CCR 45, M 12, MS 42, Rte9 45

Fred clarified some confusion Sherry had with the routes/map

Sherry noted that all the routes are pretty far south from the Houlton Band of Maliseet's major interests and therefore she would support the Penobscots and the Passamoquaddy's.

Donald noted the Passamoquaddy's concern about the CCR/PPR because the Stud Mill Rte is close to one of their communities. They have a number of traditional activities in that area. They had the same concerns with the pipeline. He would want to look at the archeological review when it was completed to see what effects it might have on the tribe.

Donald also noted that since New Brunswick is permitted to that area wouldn't the line on the U.S. automatically go there. Fred replied that we couldn't be sure due to our permitting process. It makes the most sense electrically to go to the border in that area. Fred briefly discussed Keswick and how that option does not make sense for the project and does not meet project purpose.

Donald wanted to know plans for archeological artifacts that may be recovered. Fred wanted to know who owns any recovered artifacts. Bonnie responded that the landowner does and Rick Will usually tries to get people to give them to the tribes. If the artifact is on state land it goes to the state museum. The Abby Museum holds artifacts for the Passamoquaddy's and the Army holds them for the Penobscots until they have a Federally approved holding facility. Donald noted that in the pipeline construction some artifacts were recovered and sites were impacted. As a result the pipeline set up an educational fund to mitigate for loss of cultural artifacts.

Fred wanted to know what the next steps with the tribes should be. Bonnie noted that the Penobscots would want to hold a public comment session due to the river crossing. She noted that she would support Donald if the CCR were going to impact the Passamaquaddy. Donald noted that he wants to study the Archeological Review, Phase I.

Fred explained that typically a design model is developed showing the structure types and location there of. This assists with micro siting and minimization of impacts. He also noted that BHE would do what they can to work with the tribes to help with artifacts and mitigation of cultural impacts. He discussed the possibility of moving structures along the line or longer spans to assist with this. Fred also mentioned that the layout of the line would be based on Rick Will's Phase II Archeological review.

Bonnie noted her next steps would be to study the archeological report. She also noted that she would like a summary of the routes and why we are leaning towards the routes we are.

Fred responded by noting that once additional research is concluded on the two routes a summary letter would be prepared to describe the Stakeholder process undertaken, the logic behind the route selected and a preferred route.

Fred said that he would email all the meeting participants the final matrix. He also noted that the Phase I Archeological Review would be submitted to all participants as it is completed.

Bonnie asked if the matrix includes cultural impacts? Yes

Sherry asked if it includes undeveloped areas? Yes length will be further explored and updated with the summary letter and final matrix. Will be broken down by type of consolidation.

Meeting adjourned about 10:00 am

## MEETING MINUTES

**DATE:** February 3, 10:00 PM

**LOCATION:** River Drivers Medway, Maine

**ATTENDEES:** Gil Paquette (TRC Solutions)  
Steve Sloan (BHE)  
LuAnn Ballesteros (BHE)  
Jim Clark (TRC)  
Trevor White (Passamaquoddy Tribe)  
Don Soctomah (Passamaquoddy Tribe)  
Bonnie Newsom (Penobscot Nation)  
Sharri Venno (Houlton Band of the Maliseet Indians)

**SUBJECT:** Northeast Reliability Interconnect – Cultural Resources Surveys

**NOTES BY:** Gil A. Paquette

**CC:** J. Pell (DOE)  
S. Beyer (DEP)  
J. Clement (ACOE)

- 
- Trevor asked about the view to Pocomoonshine Mountain from South Princeton Road. Gil explained that a visual analysis had been conducted along the entire length of the transmission line route and he would check on the results and if a visual simulation has been prepared for that area.
  - Gil provided a summary of the project including the project alignment, ROW width, permitting schedule, and an overview of the cultural resource surveys, methodology and fieldwork. Gil explained the efforts of earlier surveys conducted for this project and for the Maritimes & Northeast Pipeline.
  - Steve explained that although the original design was wood h-frame steel structures are being considered. Don asked about the size of the concrete foundations and Gil said he would look into it as he was unsure.
  - A copy of the final Cultural Resources Report was given to Don, Bonnie, and Sharri. An overview route map and USGS Quad based maps that depicted sensitive soils as mapped



by the SHPO and indicating survey areas for the M&N Pipeline and previous BHE efforts were provided for reference; Jim explained the methodology for conducting the cultural resource survey. He stated that no prehistoric cultural resources were found. Jim described a possibly significant 19<sup>th</sup> century historic property that had been discovered and subsequently has been avoided through route re-design. Bonnie asked if the occupant's name was known; Jim referred her to the report. Jim indicated that the NRI route passes by but does not impact known cultural sites along the Penobscot. Bonnie requested the project maps for the area from Blackman Stream to Stud Mill Road and Trevor requested the entire set. Gil said he would provide copies.

- Don asked if any wetland mitigation was proposed. Gil said there was none planned given the nature of the project and minimal permanent loss of wetland (just the poles or concrete foundations).
- Don asked about ownership and Steve stated that it would mostly be permanent easement.
- Trevor asked about the size of the ROW and Gil explained that the ROW ranges from 100 feet to 170 feet wide.
- Trevor asked about salmon habitat and first order streams. Gil explained that BHE has been consulting with the USFWS, the Atlantic Salmon Commission, and Maine IFW since the fall of 2003. Gil further explained that a site visit had been conducted with these agencies during the fall of 2004 and that a stand-alone Erosion and Sedimentation Control Manual and Vegetation Maintenance Plan have been prepared that takes into account agency input on the project.
- Steve explained the vegetation maintenance plan and the proposed buffers for streams.
- Trevor asked about herbicides. Steve gave an explanation on ROW management and how herbicides are used to convert the ROW to an herbaceous and scrub/shrub state. Trevor asked if there were any studies being proposed on herbicide impacts to wildlife and asked if BHE would commit to doing such a study. Steve explained that there is a wealth of information on herbicide interaction and that the effects are negligible even down to amphibians and insects. Steve said he would provide some references from the literature.
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- Bonnie asked about locations of brown ash and fiddle heads. Gil said he would ask the project botanist if he recalled any specific locations.
- Don asked about the International Boundary Commission permit. Gil stated that New Brunswick Power has obtained a permit and that only one joint permit is required. Don said that the St. Croix Waterways Commission is the established local office and that he was unaware of this. Don said he would look into the requirements and get back to Gil, if there was any additional work that needed to be done for this permit. It is Gil's understanding that no additional permitting is required if NB Power obtains the permit.
- Don asked about NB Power's consultation process with the Tribes in Canada. LuAnn said she would get information from NBP on their process.
- Don asked if BHE would consider providing an educational presentation on the project to the Passamaquoddy community. LuAnn said that she or Steve would be very willing to make a presentation. Don will get back to LuAnn regarding possible dates.

The meeting adjourned at 1:30.



March 14, 2005

Mr. Bernard Jerome  
Aroostook Band of Micmacs  
P.O. Box 772  
Presque Isle, ME 04769

Dear Mr. Jerome:

I want to follow-up on our phone conversation of last week to send you the information we discussed. Bangor Hydro-Electric Company is planning to build a new 345 kV transmission line from Orrington to Baileyville to connect with a similar new line in New Brunswick. We have conducted a thorough study of several possible routes. With much input, we have selected a preferred route that is generally co-located with the existing MEPCO transmission line (from Orrington to Bradley), and located with the Maritimes and Northeast gas pipeline and a private forestry road (Studmill Road) from Milford to the St. Croix River.

We are currently in the process of seeking the necessary permits for the line. Many surveys and reports have been prepared for the selected route, including an archaeological survey. I have enclosed a copy of the survey report that was prepared for our selected route along with an informational packet that provides other data and background on the project.

Please contact me if you would like any other information. We will keep you informed as we proceed.

Sincerely,

A handwritten signature in cursive script that reads "Steve Sloan".

Steve Sloan  
Manager of Permitting  
Bangor Hydro-Electric Company  
Office: 973-2568  
Cell: 949-0205  
E-mail: ssloan@bhe.com

cc: Gil Paquette – TRC Environmental Corporation



March 14, 2005

Chief Brenda Commander  
Houlton Band of Maliseet Indians  
88 Bell Rd.  
Littleton, ME 04730

Dear Chief Commander:

Thank you for participating in our meeting on February 3, 2005 regarding Bangor Hydro-Electric Company's (BHE) Northeast Reliability Interconnect (NRI). BHE welcomes your feedback on this very important project and appreciates your time.

There were a number of questions asked during the meeting and as such BHE has prepared a response 'package' to address these questions. Also included in this package are the minutes from our meeting.

- **View of Pocomoonshine Mountain from South Princeton Road** – BHE has prepared a photosimulation of the view of Pocomoonshine Mountain from South Princeton Road. The photosimulation is included in this response.
- **Size of the concrete foundations for steel structures** - The size of a concrete foundation is dependent on the size and type of pole. For the NRI, it is safe to assume that the size of a typical foundation for a single steel pole structure would be about 8' diameter. For angle structures that have more load, the diameter may increase up to 10' diameter. For an 8' diameter foundation, the foundation is typically buried 24' below ground level. This is dependent on the type of soil encountered during excavation.
- **Project maps** - USGS Quad based maps that depict sensitive soils, as mapped by the SHPO, and indicating survey areas for the M&N Pipeline and previous BHE efforts are provided in this response.
- **Literature on herbicide interaction with wildlife** - We have not made any final decisions on our choice of herbicides, but can provide information on three products that may be chosen. The key criteria being used in herbicide selection are: toxicity, persistence in the environment, soil movement, and water sensitivity. The three under consideration are: Accord (Glyphosate), Krenite (Fosamine), and Arsenal (Imazapyr), each of which rate favorably under these criteria. We have attached a few informational resources on these products for your review and we can seek more information if you desire.



- **Locations of brown ash and fiddleheads** - Art Gilman has conducted numerous botanical surveys of the project area for this project and for the Maritimes & Northeast Pipeline project. Mr. Gilman did not recall any specific or unique areas


that had populations of brown ash or fiddleheads. Furthermore, Mr. Gilman stated that the probability of finding stands of fiddlehead and brown ash along the project route are low. If additional field surveys are conducted for this project, field teams will be asked to report any sighting of brown ash or fiddleheads.

- **NB Power's consultation process with the Tribes in Canada** - LuAnn Ballesteros, spoke with Pamela McKay, her counterpart at New Brunswick Power Company and was assured that NB Power has consulted with First Nations representatives throughout the various stages of the International Power Line project. Pamela also stated that NB Power has committed to meet with First Nations representatives as the project continues to develop.

Please do not hesitate to contact me at 207-973-2568 if you require additional information. Again, thank you for your time.

Sincerely,

BANGOR HYDRO-ELECTRIC COMPANY



Steve Sloan  
Manager of Permitting

Enclosures

Cc: J. Clement (ACOE) w/o enclosures  
J. Pell (DOE) w/o enclosures  
S. Beyer (DEP) w/o enclosures  
G. Paquette (TRC) w/o enclosures  
R. McAdam (Emera) w/o enclosures  
S. Venno(Houlton Band of Maliseet Indians)



March 14, 2005

Melvin Francis, Tribal Governor  
Passamaquoddy Tribe  
P.O. Box 100  
Perry, ME 04667

Dear Governor Francis:

Thank you for your Tribe's participation in our meeting on February 3, 2005 regarding Bangor Hydro-Electric Company's (BHE) Northeast Reliability Interconnect (NRI). BHE welcomes your Tribe's feedback on this very important project and appreciates your time.

There were a number of questions asked during the meeting and as such BHE has prepared a response 'package' to address these questions. Also included in this package are the minutes from our meeting.

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Sincerely,

BANGOR HYDRO-ELECTRIC COMPANY



Steve Sloan  
Manager of Permitting

Enclosures

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S. Beyer (DEP) w/o enclosures  
G. Paquette (TRC) w/o enclosures  
R. McAdam (Emera) w/o enclosures  
D. Soctomah (Passamaquoddy Tribe) w/o enclosures  
T. White (Passamaquoddy Tribe) w/o enclosures  
S. Crawford (Passamaquoddy Tribe)



March 14, 2005

Robert Newell, Tribal Governor  
Passamaquoddy Tribe  
P.O Box 301  
Princeton, ME 04668

Dear Governor Newell:

Thank you for your Tribe's participation in our meeting on February 3, 2005 regarding Bangor Hydro-Electric Company's (BHE) Northeast Reliability Interconnect (NRI). BHE welcomes your Tribe's feedback on this very important project and appreciates your time.

There were a number of questions asked during the meeting and as such BHE has prepared a response 'package' to address these questions. Also included in this package are the minutes from our meeting.

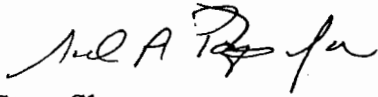
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Please do not hesitate to contact me at 207-973-2568 if you require additional information. Again, thank you for your time.

Sincerely,

BANGOR HYDRO-ELECTRIC COMPANY



Steve Sloan  
Manager of Permitting

Enclosures

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T. White (Passamaquoddy Tribe)



March 14, 2005

Chief James Sappier  
Penobscot Nation  
12 Wabanaki Way  
Indian Island, ME 04468

Dear Chief Sappier:

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S. Beyer (DEP)  
G. Paquette (TRC)  
R. McAdam (Emera)  
B. Newson (Penobscot Tribe, THPO)

## MEETING MINUTES

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LOCATION: River Drivers Medway, Maine

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Steve Sloan (BHE)  
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Jim Clark (TRC)  
Trevor White (Passamaquoddy Tribe)  
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Bonnie Newsom (Penobscot Nation)  
Sharri Venno (Houlton Band of the Maliseet Indians)

SUBJECT: Northeast Reliability Interconnect – Cultural Resources Surveys

NOTES BY: Gil A. Paquette

CC: J. Pell (DOE)  
S. Beyer (DEP)  
J. Clement (ACOE)

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The meeting adjourned at 1:30.

# NON-TARGET IMPACTS OF THE HERBICIDE GLYPHOSATE

A COMPENDIUM OF  
REFERENCES AND ABSTRACTS

4th EDITION



INFORMATION REPORT  
APPLIED MAMMAL RESEARCH INSTITUTE



# Technical Information

## FATE OF ARSENAL® IN FOREST WATERSHEDS

### ABSTRACT-

This study, conducted by Dr. J.L. Michael, U.S. Forest Service, Auburn, AL, evaluated the fate of imazapyr (ARSENAL) herbicide on large forest-land watersheds on typical soils of the loblolly pine (*Pinus taeda*) growing regions. Imazapyr was applied aerially to a 40 hectare watershed near Weedowee, Alabama in May and a 121 hectare watershed near Fayette, Alabama in June of 1985. Applications were made by helicopter using raindrop nozzles calibrated to deliver a rate of 2.24 kg/ha (2 lb/a, which is 2-4X labeled use rates) of imazapyr. Watershed runoff was gauged with 30 cm H-flumes equipped with ISCO model 2300 flow meters and Model 2310 plotters. Subsamples of stormflow and baseflow were collected in timed sequence and based on stream stage. Grab samples were collected weekly at the weir, perimeter, 30, 60, and 150 meters downstream from the site perimeter. Stream sediment samples were also analyzed. Soil core samples were collected to a depth of 50 cm from sites that were either bareground, or covered with forest litter at the time of application. Pine needles, foliage of competing vegetation and forest litter were also sampled.

Water samples taken from the stream as a function of storm events showed little or no baseflow contamination. This is an indication that movement of imazapyr through the soil profile did not contribute to stream contamination via leaching. When a streamside management zone was used, imazapyr was not detected in the stream flow during application. "Most off-site movement occurred with the first two storm events at both sites. Observed stormflow concentrations compare favorably with those for other forest herbicides applied at similar rates." There was no significant off-site movement via stream sediment from either site. Movement of imazapyr through the soil profiles occurred but was restricted to the upper 30 cm. "The appearance of imazapyr in only 1% of the samples taken below 30 cm indicates very low probability of groundwater contamination. That herbicides are used only once or twice in the life of a stand further strengthens this conclusion." The calculated half-life of imazapyr in soil ranged from 19 to 34 days. Half-life of imazapyr in plant and pine tissue ranged from 12 to 40 days, and 37 to 44 days in litter.

For further information about ARSENAL Applicators Concentrate contact your local American Cyanamid representative.





# Toxicology and Metabolism of Arsenal<sup>IR</sup>

- Honey Bee - Contact LD<sub>50</sub> > 25g ae/Bee\*
- Rabbits - Dermal LD<sub>50</sub> > 2000mg/kg
- Rats - Oral LD<sub>50</sub> > 5000mg/kg
- Earthworm - 14 day LC<sub>50</sub> > 132.5 ppm
- Mallard Ducks - LD<sub>50</sub> > 2150mg/kg\*
- Bobwhite Quail - LD<sub>50</sub> > 2150mg/kg\*

\*Highest level tested

# Toxicology and Metabolism of Arsenal<sup>R</sup>

- Bioaccumulation
  - Does not accumulate in tissue
- Soil Microorganisms
  - No adverse effects on number, growth rate, or functioning of soil microorganisms
- Metabolism in Rats
  - >85% excreted in urine within 24 hours

# Chronic Toxicity of Arsenal<sup>R</sup>

- **Mutagenicity**  
No mutagenic activity has been observed with technical imazapyr
- **Teratogenicity**  
fetal malformation  
No teratogenic or fetotoxic were found at all dose levels in both rats and rabbits
- **Carcinogenicity**  
No oncogenic effects were observed at all dose levels in mice, rats, and purebred beagle dogs



# Accord Herbicide Technical Fact Sheet

Number 1

June 1995

## Forestry/Utility Rights-of-Way

### Introduction

Accord herbicide, which is made up of glyphosate — its active ingredient — and water, controls undesirable vegetation in timber reforestation projects and utility right-of-way maintenance. Accord herbicide is recommended for use in preparing or establishing wildlife openings, and in or near wetlands to control non-native, invasive species within utility rights of way and forestry sites. Vegetation management professionals can apply Accord herbicide according to labelled directions with virtually no risk of affecting human health, wildlife or water quality.

Accord and other glyphosate-based herbicides made by Monsanto are broad-spectrum herbicides with no soil residual activity. The effectiveness and certain desirable attributes of glyphosate have made it one of the most widely used herbicides in the world today. The Monsanto family of glyphosate-based herbicides is made up of more than 90 different brands used in agricultural, industrial and residential markets in more than 100 countries worldwide.

Monsanto introduced Roundup herbicide, another glyphosate-based product, in 1974 in several markets worldwide. The U.S. Environmental Protection Agency registered Roundup in 1976 for many agricultural uses. Accord herbicide was registered in 1986.

### How Does Accord Herbicide Work?

The active ingredient in Accord is glyphosate, the common name for N-(phosphonomethyl) glycine. Glyphosate is usually formulated as a water soluble salt to meet a variety of weed control needs. Glyphosate inhibits an enzyme that is essential to formation of specific essential amino acids in the plant. When properly applied to the leaves of actively growing vegetation, glyphosate-based herbicides are absorbed into the above-ground parts of weeds such as green leaves or green stems. Once there, glyphosate moves or "translocates" throughout the plant.

Obvious signs of treatment may not be visible for four days in annual weeds and up to seven days or more in perennials. Visible effects include gradual wilting, yellowing — followed by complete browning, deterioration of plant tissue and ultimate decomposition of the underground roots and rhizomes. Since glyphosate works only on plants that have emerged through the soil, it will not affect seeds that have not yet sprouted.

### Are Herbicides Regulated?

Hundreds of separate studies on Accord and other Monsanto glyphosate products have been reviewed by the EPA for health, safety and environmental effects. In addition, state agencies have carefully reviewed these studies, examined product use for specific geographies, and are responsible for strict registration standards as applied to pesticides. Monsanto's glyphosate herbicide has one of the most extensive worldwide health and environmental effects data bases ever completed on a herbicide, and studies continue today as new requirements come into existence.

### Extensive Testing

EPA classified glyphosate, the active ingredient in Accord herbicide, in Category E (evidence of non-carcinogenicity for humans), based on a thorough review of results from Monsanto's extensive toxicological tests required by the agency. This very positive rating means that glyphosate has been placed in the most favorable category possible — one that has been given to only a limited number of pesticide active ingredients. (The categories are rated from A through E, with "E" being the most favorable.)

Toxicological testing with laboratory animals serves as a model for evaluating the potential of a substance to cause adverse effects in humans. Toxicology studies measure the effects of direct and indirect exposure to a myriad of substances including herbicides and pharmaceuticals. In addition to these standard tests, numerous studies have also been conducted with Monsanto glyphosate products on other non-target species such as birds, deer, mice, voles, chipmunks and various aquatic organisms.

For example, this diverse testing focused on specifics such as how glyphosate and other herbicides affect birds' ability to lay eggs, the ability of the eggs to survive and the thickness of the egg shells. Other studies examined the impact of glyphosate on habitat change and bacteria in the soil.

### ORAL TESTS

The results of acute (single exposure) oral toxicology tests using rats are expressed as LD50 values, or the amount of the substance that produced death in 50 percent of the test animals. EPA places herbicides into one of four categories, with "I" being the most

toxic and "IV" the least toxic. Glyphosate is rated as an EPA Category IV compound in oral rat tests. Here are the approximate oral LD50 values for rats fed glyphosate and some other familiar substances to help put these numbers into perspective. The smaller the LD50, the greater the toxicity. (Glyphosate is less toxic to rats than table salt following acute oral ingestion.)

COMPOUND	LD50	TOXICITY
		Least
Glyphosate	5,600 mg/kg*	↓
Table salt	3,000 mg/kg	
Vitamin A	2,000 mg/kg	
Aspirin	1,000 mg/kg	
Nicotine	53 mg/kg	
		Most

\*The mg/kg for LD50 values is in milligram test substance per kilogram of body weight.

#### EYE STUDIES

A common-use spray solution of glyphosate was rated as "slightly irritating" in eye studies. The eye irritation observed following exposure to the spray solution was completely reversible.

#### SKIN STUDIES

The acute skin LD50 is greater than 5,000 mg/kg. In acute skin studies using laboratory animals, glyphosate was non-irritating.

#### INHALATION STUDIES

Glyphosate does not turn into vapor or gas, and inhalation is extremely unlikely when the product is used according to label directions. Since glyphosate has a low vapor pressure, it does not tend to vaporize. The likelihood of vapor inhalation and redistribution by air movement is thus very low.

#### LONG-TERM TOXICITY TESTS

Long term (chronic) toxicological studies have been conducted to determine the effects of prolonged exposure to glyphosate. These studies were conducted on rats, mice and other laboratory animals. High doses were administered on a daily basis for the average lifetime (two years) of rats and mice and for one year for dogs. Again, these results, described below, contributed to the extensive toxicological data base reviewed by EPA.

#### ONCOGENICITY TESTS

The results of long-term toxicity tests on glyphosate resulted in glyphosate being classified as Category E.

#### REPRODUCTIVE AND MUTAGENICITY TESTS

Long-term feeding studies have also shown that Monsanto's glyphosate does not cause birth defects or reproductive problems in laboratory animals. Pregnant rabbits and rats given high-dose levels of glyphosate delivered normal offspring. In a study in which glyphosate was fed continuously over two generations, weight reductions were seen only at a very high-dose

level. Lower dose levels in this study and in a three-generation study did not affect the ability of rats to mate, conceive, carry or deliver normal offspring. Nor were any significant adverse effects observed on the ability of those offspring to develop into normal adults.

An extensive battery of mutagenicity and genotoxicity assays designed to evaluate three major objectives — gene mutations, chromosome aberrations and DNA damage and repair — were also performed using glyphosate. The results of these studies show glyphosate does not interfere with the genetic make-up of cells.

#### Health and Safety

Accord herbicide has been evaluated in numerous studies with laboratory animals and wildlife species using exposure levels far in excess of those resulting from labeled use of the herbicide. Data from laboratory studies conducted with Accord herbicide are summarized in Table 1.

#### Accord Herbicide

TABLE 1

Exposure Route	Animal	Toxicity	EPA Category*
Oral	rat	>5,000 mg/kg	IV
Dermal	rabbit	>5,000 mg/kg	IV

Eye and skin irritation studies were also conducted. The results are presented in Table 2. The test results are expressed as a numerical value based on a scale that reflects the increasing degree of irritation. This scale ranges from 0 (no effect) to 110.0 (maximum irritation) for eyes and 0 to 8.0 for skin:

#### Accord Herbicide

TABLE 2

Exposure Route	Animal	Irritation Scale
Eye	rabbit	0.0 on a scale of 110.0 (non-irritating)
Skin	rabbit	0.1 on a scale of 8.0 (practically non-irritating)

\*The U.S. Environmental Protection Agency has established categories to determine acute toxicity ranging from slight to moderate to severe ratings, with Category I being severe and Category IV being slight.

#### Wildlife Effects

The high water solubility of glyphosate suggests that it should not bioaccumulate, which has been confirmed by numerous studies. Work done with laboratory animals shows that glyphosate is poorly absorbed when ingested. Any absorbed glyphosate is rapidly eliminated, resulting in minimal tissue retention. Feeding studies with chickens, cows and pigs have shown extremely low to no residues in meat and fat following repetitive exposure. Negligible residues have also been reported in wild animals such as voles, chipmunks, hares and moose after feeding in treated

areas. Similarly, a series of bioaccumulation studies were done to determine if glyphosate concentrated in the edible portions of fish and marine organisms. The results clearly indicated that glyphosate did not accumulate. Moreover, transfer of the organisms to glyphosate-free water resulted in virtually complete elimination of glyphosate. Therefore, the data obtained for numerous studies with mammals, birds, fish and marine organisms firmly support the conclusion that glyphosate will not bioaccumulate in the food chain.

### **Environmental Fate**

In addition to toxicology tests, a completely different set of tests are conducted to determine how the herbicide behaves in the environment. One series of tests is conducted to measure what happens to the herbicide itself when it enters the environment. Some studies measure the tendency of the chemical to bind to the soil and its likelihood of moving through the soil after rainfall. Other tests measure the ability of microorganisms in the soil to degrade the product.

### **MICROBIOALLY DEGRADES**

Monsanto's glyphosate-based herbicides exhibit certain desirable soil characteristics. For example, they have no residual activity. Tests have shown that they bind tightly to the soil and will not harm nearby vegetation. Once in contact with the soil, glyphosate is broken down by soil microorganisms. And, the process of glyphosate degradation doesn't harm the microorganisms, either.

Glyphosate degrades in the soil. The average half-life in soil is less than 45 days. Studies show that glyphosate does not accumulate in soil/environment after repeated applications over several years or after repeated applications in one year.

Numerous tests have shown that glyphosate binds tightly to soil particles. In a laboratory study, columns of soil treated with glyphosate were leached continuously with water for 45 days. Results demonstrate that none of the glyphosate was released from the soil. Based on this study, and the results of numerous field dissipation studies, it is highly unlikely that glyphosate will move into groundwater.

### **Residue And Metabolism Studies**

Metabolism studies are conducted on crops to determine how a herbicide is metabolized or processed by plants. Residue studies then determine the amount of the parent herbicide or its metabolites that remain in the crop when the herbicide is applied under normal use conditions. Dissipation and residue studies are carried out in a number of locations over a wide geographic range to ensure that the effects of various climates and soil types are examined. If residues are found, studies are then performed to determine if there is any concentration in a particular food fraction such as in flour or vegetable oil.

Based on the results of these residue studies, the EPA establishes tolerance levels, or maximum legal limits, for a herbicide on various crop commodities. These limits are set to ensure that human exposure does not exceed an acceptable level, referred to as the Acceptable Daily Intake or ADI. This level is generally 100 times lower than the dose which produced no effects in any animal study. The tolerances set by the EPA are then enforced by the Food and Drug Administration (FDA), which is responsible for monitoring residue levels in domestic and imported crops.

Over a hundred crop metabolism and residue studies have been conducted using Monsanto's glyphosate-based herbicides, on crops ranging from major row crops such as corn and soybeans to tropical fruits. Crop residues are primarily in the negligible range. Public exposure to residues in food crops is extremely low, if present at all.

### **No Bioaccumulation**

In studies performed with glyphosate, the bioconcentration factors for fish tissues demonstrated that glyphosate does not accumulate in fish. In fact, the low bioaccumulation factor is a result of glyphosate being readily soluble in water and therefore being eliminated quickly from organisms in water. Other animal species studies with similar conclusions include marine mollusks and crustaceans. Moreover, tissue analyses showed that of the trace amounts of glyphosate residues found, more than 75 percent was contained in non-edible portions of the fish. When exposed fish were transferred to glyphosate-free water, virtually all the glyphosate was eliminated from their tissues.

### **No Volatility**

Accord herbicide is non-volatile. That means that Accord does not produce vapors that could move through the air and damage non-target vegetation; and there are no odors to disturb the public.

### **Thermal Degradation Studies**

Some vegetation management practices involve the burning of weeds and brush following herbicide application. An assessment of the thermal decomposition products of Accord clearly shows that they will not cause product-related adverse effects to individuals exposed to the smoke and gases formed as a result of burning treated vegetation. This assessment is based on an application rate of 5 quarts Accord herbicide/acre, and zero decomposition of glyphosate prior to burning.

### **Ecosystem Studies**

Because Accord and other glyphosate-based herbicides are widely used throughout the world, ecosystem studies have been conducted to assess what effect, if any, the use of glyphosate has on an ecosystem. Results from two landmark, independently



conducted and comprehensive ecosystem studies — the Canadian Carnation Creek Study<sup>1</sup> and the Oregon State University<sup>2</sup> study — showed:

Accord herbicide, when used according to labelled directions:

- > Degrades in soil
- > Is essentially immobile in soil
- > Is not a threat to either groundwater or surface water
- > Does not cause adverse health or migrational changes in fish

\*Has no effect on aquatic or terrestrial invertebrates or waterfowl.

The acute toxicological effects of exposure to Accord herbicide and glyphosate were also assessed with a wide variety of sensitive aquatic species. The results in Table 3 show that both Accord and glyphosate are practically non-toxic to most aquatic species tested.

#### Accord Herbicide Environmental Toxicity Data

96-hour LC50 Bluegill Sunfish	>1,000 mg/l (practically non-toxic)
96-hour LC50 Trout	>1,000 mg/l (practically non-toxic)
96-hour LC50 Carp	>10,000 mg/l (practically non-toxic)
48-hour EC50 <i>Daphnia magna</i>	930 mg/l (practically non-toxic)

#### Glyphosate

Herbicide Environmental Toxicity Data	
96-hour LC50 Grass shrimp	>281 mg/l (practically non-toxic)
96-hour LC50 Mysid shrimp	>1,000 mg/l (practically non-toxic)
96-hour EC50 Sea urchin	>1,000 mg/l (practically non-toxic)
96-hour Fiddler crabs	>934 mg/l (practically non-toxic)
48-hour LC50 Oyster larvae	>10 mg/l (slightly toxic)

1. Forest Pest Management Institute. *Proceedings of the Carnation Creek Herbicide Workshop* (Sault Ste. Marie, Ontario, Ministry of Forests, Research Branch, 1989.)

2. Newton, M., Howard, K.M., Kelpas, B.R., Danhaus, R., Lottman, C.M., and S. Dubbleman. (1984). Fate of Glyphosate in an Oregon Forest Ecosystem. *Journal of Agricultural and Food Chemistry*, 32:1144.

#### Habitat Restoration & Enhancement

Confirmed results such as these have led various habitat restoration and wildlife protection groups to use Accord herbicide in the restoration and maintenance of wildlife habitat and refuge areas in utility rights-of-way and forestry sites. Additionally, state departments of fish and game, natural resources and environment commonly choose glyphosate-based herbicides for use in delicate wildlife areas.

When properly applied at labelled rates, Accord herbicide offers numerous favorable toxicology and environmental characteristics. This combination gives applicators vast flexibility for controlling over 170 weeds in commercial, public and forest areas.

#### SUMMARY

The results of extensive toxicological studies in animals have demonstrated that glyphosate, the active ingredient in Accord herbicide, DOES NOT cause carcinogenicity, birth defects, mutagenic effects, neurotoxic effects or reproductive toxicity. In addition, extensive environmental fate studies and review have shown that no significant adverse effects to the environment occurred following exposure to Accord and other Monsanto's glyphosate herbicides.

#### MONSANTO COMPANY

Monsanto, the manufacturer of Accord and other glyphosate-based herbicides, encourages the public to become more knowledgeable about its products. More information can be obtained by calling: 1-800-332-3111, or writing to Monsanto Company, 800 N. Lindbergh Blvd., St. Louis, MO 63167.

For additional information, consult the appropriate federal and state supplemental labels for Accord.

  
**HERBICIDE**  
by **Monsanto**

## fosamine ammonium (Krenite) Herbicide Profile 2/85

### fosamine ammonium

CHEMICAL NAME: Ammonium ethyl carbamoylphosphonate (56)

TRADE NAME(S): Krenite (56)

FORMULATION(S): Krenite brush control agent is a liquid containing 41.5% active ingredient (4 lb/gal). Krenite S brush control agent has same active ingredient content but includes a surfactant (56).

TYPE: Herbicide

BASIC PRODUCER(S): E.I. du Pont de Nemours Co., Inc.  
Biochemicals Dept.  
1007 Market St.  
Wilmington, DE 19898

STATUS: General use

PRINCIPAL USES: Used as a foliar spray at rates of 1 1/2 to 3 gallons product (6 to 12 lb ai)/acre applied in late summer or early fall for control and/or growth suppression of many woody species. Susceptible treated plants normally fail to refoliate during the growing season following treatment and subsequently die. Krenite may be used on noncropland areas such as railroad, pipeline, utility and highway rights-of-way, drainage ditchbanks, storage areas, industrial plant sites and other similar areas including land adjacent to and surrounding domestic water supply reservoirs, supply stations, lakes and ponds. It is also used for field bindweed control in noncropland areas (56).

Registered for control and growth suppression of blackberry, white oak, water oak, red oak, loblolly pine, Virginia pine, sweet gum, sumac and black locust; salmonberry, thimbleberry, vine maple, American elder, Eastern white pine, multiflora rose, slippery elm, tree-of-heaven, wild grape, wild plum and quaking aspen; partial control and growth suppression of other brush plants such as red alder, hawthorn, wild cherry, maple, white ash, black gum, hickory, willow, sassafras, yellow poplar, elm, big leaf maple, choke cherry, persimmon, red maple, sourwood and tulip tree (yellow poplar). It is also registered for control of field bindweed. It is being evaluated for bracken (*Pteridium* sp.) and for selective use in forestry (58).

APPLICATION METHOD(S): As a foliar spray either by air or ground equipment (58).

### II. PHYSICAL PROPERTIES

MOLECULAR FORMULA: C<sub>3</sub> H<sub>8</sub> N O<sub>4</sub> P (62)

MOLECULAR WEIGHT: 153.1 (62)

PHYSICAL STATE: White crystalline solid (pure compound) (31v)  
ODOR: Negligible odor (pure compound (31v)  
MELTING POINT: 175 C (pure compound) (31v)  
VAPOR PRESSURE:  $4 \times 10^{-6}$  mmHg at 25 C (pure compound) (31v)  
SOLUBILITY: 1.79 kg/kg water at 25 C (pure compound) (62)

### III. HEALTH HAZARD INFORMATION

OSHA STANDARD: NA

NIOSH RECOMMENDED LIMIT: NA

ACGIH RECOMMENDED LIMIT: NA

#### TOXICOLOGY

##### A. ACUTE TOXICITY

DERMAL: LD50 = >1,680 mg/kg (rabbit, "Krenite"); >5,000 mg/kg (rabbit, "Krenite" S) (31v).  
"Krenite" - Not a primary skin irritant when applied as 25% aqueous solutions to shaved, intact, or abraded skin of guinea pigs; no evidence of sensitization. Application of 50% aqueous solutions caused reversible mild to moderate irritation in rabbits (31v).  
"Krenite" S - Not a primary skin irritant when applied as 0.5 ml undiluted formulation to shaved, intact, or abraded skin of rabbits (31v).  
  
ORAL: LD50 = 24,400 mg/kg (non-fasted male rats, "Krenite"); >7380 mg (guinea pigs, "Krenite"); >15,000 mg/kg (female beagles, "Krenite"); >5,000 mg/kg (fasted male and female rats, "Krenite" S) (31v).  
  
INHALATION: LC50 = 56.6 mg/l a.i. (male rat, "Krenite"); >42 mg/l a.i. (female rat, "Krenite") (31v).  
LC50 = 3.20 mg/l a.i. (male rat, "Krenite" S); 2.75 mg/l a.i. (female rat, "Krenite" S) (31v).  
  
EYES: "Krenite" = Administration of 0.1 ml product to the rabbit eye resulted in no evidence of eye irritation.  
"Krenite" S - Caused mild to no corneal opacity and temporary severe to moderate conjunctival irritation in the unwashed rabbit eyes. Eyes returned to normal within 3 days except one unwashed and one washed eye, which had lingering mild conjunctival redness, but were normal within 7 days (31v).

##### B. SUBACUTE AND CHRONIC TOXICITY:

90-day rat feeding study: Slight effects on kidneys of male rats at

5000-10,000 ppm, 1000 ppm no-effect level.

6-month dog feeding study: No nutritional, clinical hematological, biochemical, urinary, or gross pathological evidence of toxicity in the test dogs fed 10,000 ppm. Relative stomach weights were significantly high at 10,000 ppm but were associated with no other clinical or gross pathological changes.

1-generation rat reproduction study: No reproductive effects seen at 5000 ppm, the highest level fed.

Teratogenicity studies: Not teratogenic or embryotoxic in rats at 10,000 ppm, the highest level fed.

Mutagenicity studies: Not mutagenic in Ames, CHO point mutation and DNA repair (UDS) assays. Mutagenic in in vitro Cytogenetic assay, but negative in in vivo Cytogenetic assay (31v).

#### IV. ENVIRONMENTAL CONSIDERATIONS

Safe to fish and wildlife (8b).

Bluegill sunfish LC50 (96-hr) is greater than 670 ppm (formulation)  
Fathead Minnow LC50 (96-hr) is greater than 1000 ppm (formulation)  
Rainbow Trout LC50 (96-hr) is greater than 1000 ppm (formulation)

Bobwhite Quail LD50 is greater than 10,000 mg/kg (formulation)  
Mallard Duck LD50 is greater than 10,000 mg/kg (formulation)

In a 28-day (14C) fosamine ammonium bioaccumulation study in catfish, accumulation factor (ratio of residues in fish to residues in water) was less than 12 (J. Toxic. Environ. Health. 5:957-963, 1979) (31v).

Fast disappearance rate in soil; half-life of about 7-10 days (J. Ag. & Food Chem. 27 (3) 564-571, 1979). No effects on soil microbes (Soil Science 128, 23, 1979) (31v).

LC50 (96-hr) is: for bluegill 278 mg a.i. (as e.c.)/l; for rainbow trout >415 mg a.i. (as e.c.)/l (62).

#### Behavior In Or On Soils

1. Adsorption and leaching characteristics in basic soil types: In field soil studies (Florida, Delaware and Illinois) with 14C-labeled ammonium ethyl carbamoylphosphonate, because of rapid degradation, there was very little or no downward movement of ammonium ethyl carbamoylphosphonate or its degradation products.
2. Microbial breakdown: Rapidly decomposed by soil microorganisms. Laboratory biometer flask tests to evaluate microbial degradation in the dark were run with 14C-carbamoyl labeled ammonium ethyl carbamoylphosphonate at 4 and 20 ppm in two soil types. These tests showed that evolved 14CO2 accounted for 45 to 75% of original 14C after 90-day incubations. Reincorporation of 14C was noted, particularly in field soils.
3. Loss from photodecomposition and/or volatilization: Separate experiments which measure photodecomposition in water indicate that both artificial and natural sunlight exposures have little effect. Photosensitizers do not appear to accelerate the

photodegradation process.

4. Persistence in soils: Greenhouse soil disappearance test with <sup>14</sup>C-labeled ammonium ethyl carbamoylphosphonate indicated about a 10-day half life for the intact compound. Also, under field conditions in Florida, Delaware and Illinois the half life for the compound was about 1 week. In these field studies, the half life for total <sup>14</sup>C-activity was 2 to 6 months. Much of the residual <sup>14</sup>C was reincorporated into the soil organic matter, e.g., a-humus, B-humus and soluble humin fractions.

#### References

- Han, Jerry C.Y. and R.L. Krause. 1979. Microbial Activity in Soils Treated with Fosamine Ammonium. Soil Science. 128:23-27.
- Han, Jerry C.Y. 1979. Stability of (<sup>14</sup>C) Fosamine Ammonium in Water and Soils. Agric. Food Chem. 27(3):564 (58).

#### V. EMERGENCY AND FIRST AID PROCEDURES

The chemical information provided below has been condensed from original source documents, primarily from "Recognition and Management of Pesticide Poisonings", 3rd ed. by Donald P. Morgan, which have been footnoted. This information has been provided in this form for your convenience and general guidance only. In specific cases, further consultation and reference may be required and is recommended. This information is not intended as a substitute for a more exhaustive review of the literature nor for the judgement of a physician or other trained professional.

If poisoning is suspected, do not wait for symptoms to develop. Contact a physician, the nearest hospital, or the nearest Poison Control Center.

**SYMPTOMS:** No symptoms of human intoxication have been reported. In small mammals mild diarrhea has been observed after repeated oral dosings (58).

**SKIN CONTACT:** Wash with plenty of soap and water (31v).

**EYE CONTACT:** Flush with plenty of water (31v).

#### VI. FIRE AND EXPLOSION INFORMATION

**GENERAL:** Non-flammable (Krenite) (31w).

**FIRE FIGHTING/EXTINGUISHER TYPE:** Conventional methods (water spray, CO<sub>2</sub>, foam, dry chemical). Use self-contained breathing apparatus (Krenite) (31w).

#### VII. COMPATIBILITY

Not normally used in combination with other pesticides. Somewhat corrosive to brass or copper sprayer parts (58).

#### VIII. PROTECTIVE MEASURES

STORAGE AND HANDLING: Aqueous formulations and spray tank solutions are stable. Subject to decomposition in dilute solution (5 ppm) under acid conditions (58).

Keep out of reach of children. Do not contaminate water, food, or feed by storage. Keep from contact with fertilizer, insecticides, fungicides, and seed. May irritate eyes, nose, throat, and skin. Avoid breathing spray or mist. Avoid contact with skin, eyes, and clothing. Do not use on food crops. Do not allow drift or spray mist to contact desirable trees, shrubs, or other plants, as injury may result. Do not apply directly to water. Do not contaminate water by cleaning of equipment or disposal of wastes (31v).

#### IX. PROCEDURES FOR SPILLS AND LEAKS

IN CASE OF EMERGENCY, CALL, DAY OR NIGHT  
(800) 424-9300  
PESTICIDE TEAM SAFETY NETWORK/CHEMTREC

Clean up promptly; do not flush with water. Absorb liquid spills with earth or sand and pick up by most effective means (Krenite) (31w).

#### X. LITERATURE CITED

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56. Farm Chemicals Handbook, 70th ed. 1984. R. T. Meister, G. L. Berg, C. Sine, S. Meister, and J. Poplyk, eds. Meister Publishing Co., Willoughby, OH.
58. Weed Science Society of America, Herbicide Handbook Committee. 1983. Herbicide handbook of the weed science society of America, 5th ed. Weed Science Society of America, Champaign, IL. 515 pp.
62. The Pesticide Manual: A World Compendium, 7th ed. 1983. C.R. Worthing, ed. The British Crop Protection Council, Croydon, England. 695 pp.

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For more information relative to pesticides and their use, please  
contact the PMEP staff at:

5123 Comstock Hall  
Cornell University



Ithaca, New York 14853-0901  
(607)-255-1866



Last Modified: 03/01/2001

Questions regarding the development of this web site should be directed to the [PMEP Webmaster](#).

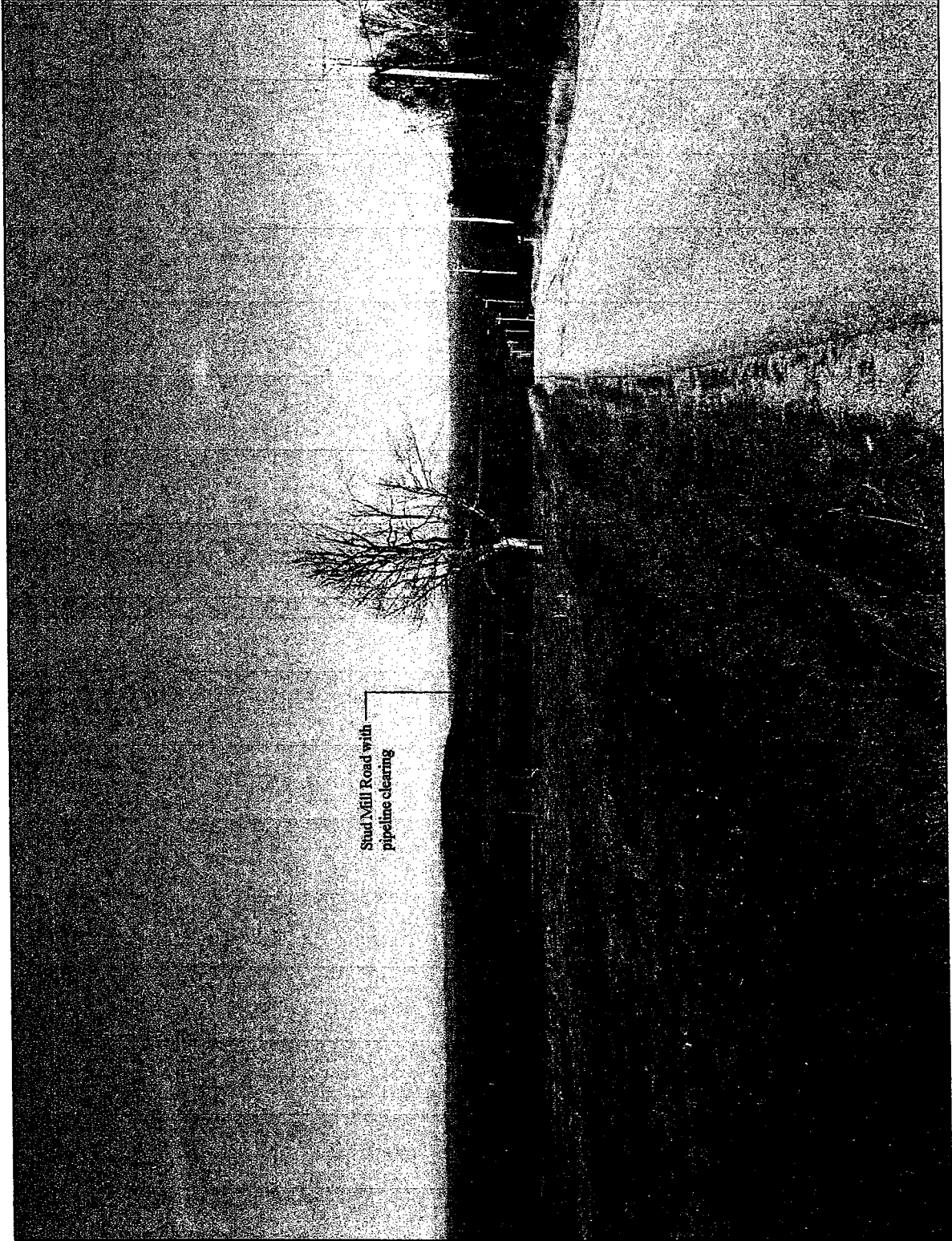
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**Northeast  
Reliability  
Interconnect**

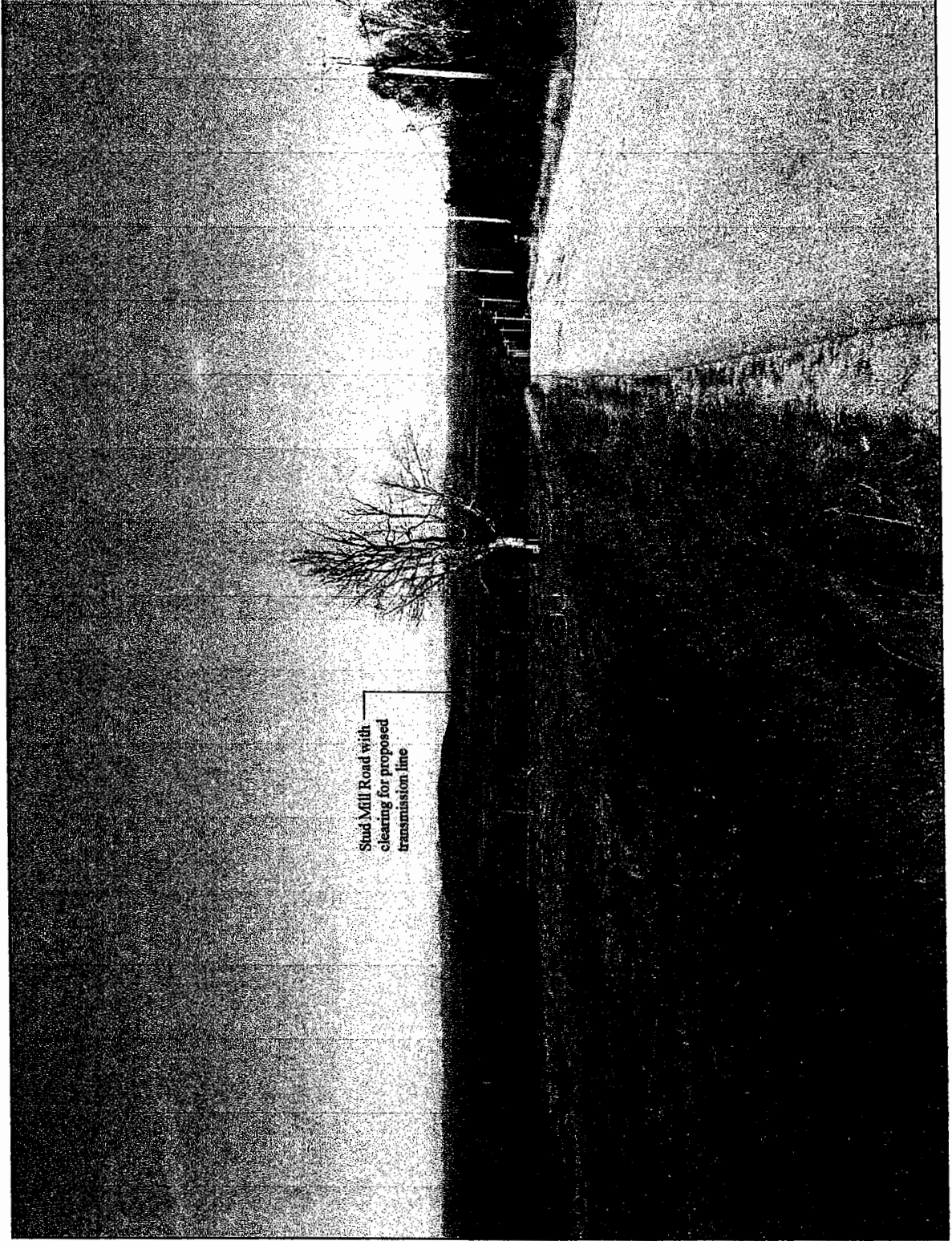
Bangor Hydro-Electric Company



Photostimulation 144: Current  
view looking west toward  
Pocomoonshine Mountain from  
South Princeton Road. Photo  
taken by TJD&A, October 19,  
2004.

**Northeast  
Reliability  
Interconnect**

Bangor Hydro-Electric Company



Stud Mill Road with  
clearing for proposed  
transmission line

Photosimulation 14B:  
Photosimulated view of the  
proposed project looking west  
toward Pocomooshine Moun-  
tain from South Princeton Road.  
Photo taken by TUD&A, October  
19, 2004.